United States Patent [19]

Yamamoto

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[54] **HANDGUN, BLIND RIVET INSTALLATION**

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[51] **Int. Cl.**[3] **B21D 9/05**

[52] **U.S. Cl.** **72/391**; 92/13.6

[58] **Field of Search** 72/391, 114; 92/13.6

[56] **References Cited**

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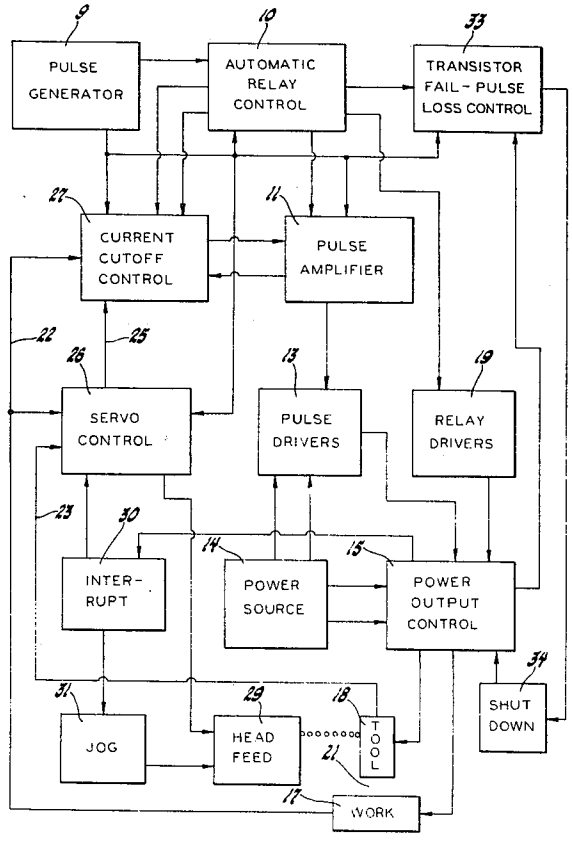
Primary Examiner—Francis S. Husar
Assistant Examiner—Linda McLaughlin

[57] **ABSTRACT**

A hydraulic gun for installing inserts in which the hydraulic mechanism becomes inoperative after the mandrel of the gun travels a predetermined distance. The gun includes a means for adjusting the predetermined distance of mandrel movement.

10 Claims, 3 Drawing Figures



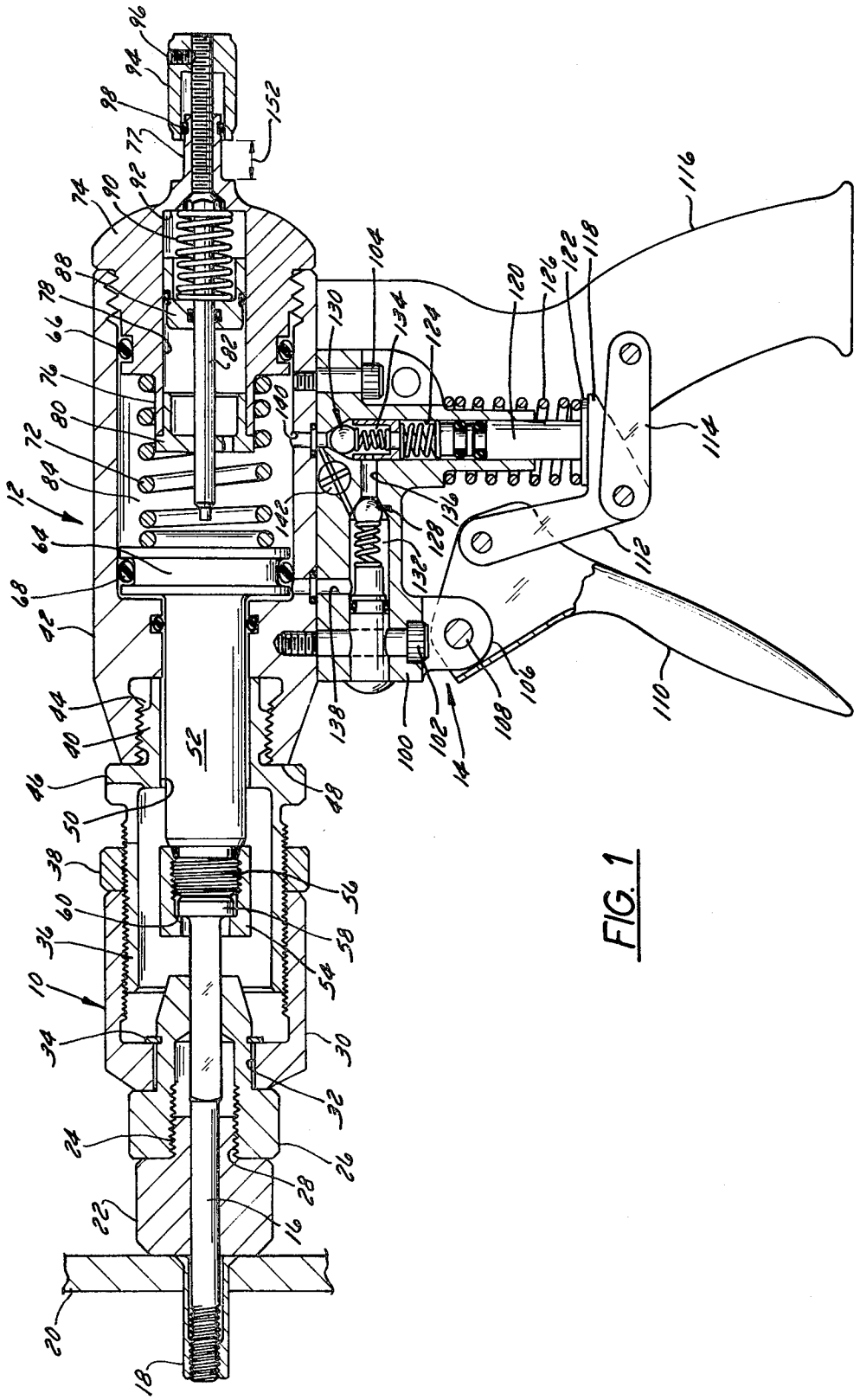

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FIG. 1

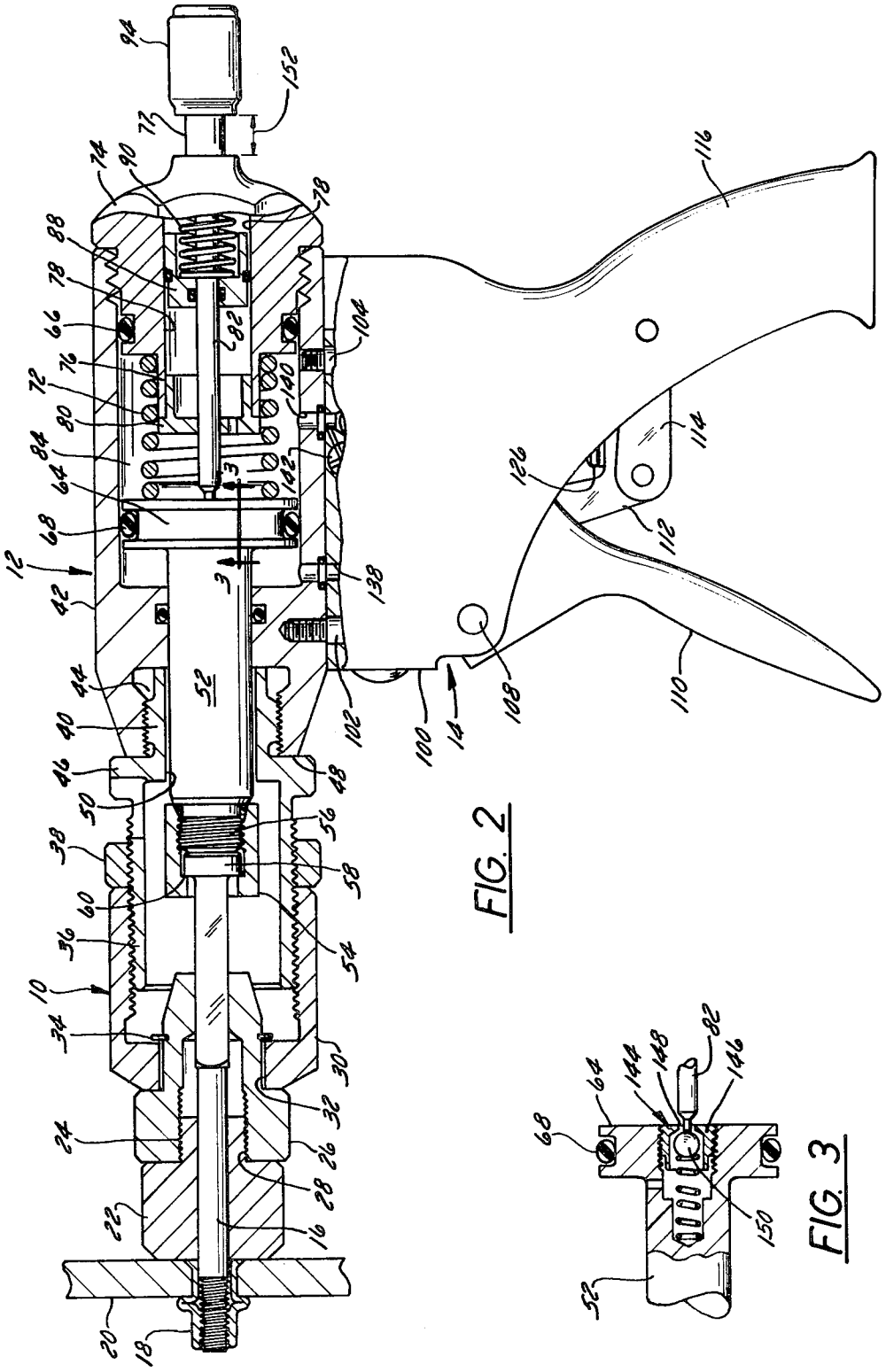

FIG. 2

FIG. 3

HANDGUN, BLIND RIVET INSTALLATION

FIELD OF THE INVENTION

The present invention relates to a tool for installing inserts and more particularly to a hydraulic gun for installing inserts into panels.

BACKGROUND OF THE INVENTION

Hydraulic guns for the installation of rivets and self-locking inserts are well-known and can be obtained from various manufacturers such as the Parker Manufacturing Company in Worcester, Massachusetts. The hydraulics guns are particularly useful in the installation of inserts in sheet metal where the inserts may be used in a number of applications such as mounting brackets to tubing, covers to electronic chassis, and covers to communication equipment. Where it is necessary to place hundreds of such inserts in place, the guns provide a quick and efficient means for installing the inserts.

The hydraulic guns generally are comprised of three parts: the adapter/mandrel assembly; the hydraulic housing; and the pump assembly. The adapter/mandrel assembly is provided with a shaft, i.e., mandrel, with a threaded end upon which an insert is threaded. The hydraulic housing covers, among other parts, a cylinder and a piston which is coupled to the mandrel. The pump assembly supplys the fluid under pressure to the hydraulic housing.

Briefly, the inserts are threaded in the mandrel and are inserted into an opening in a panel until the circular end flange of the insert abuts the panel surface. Generally, the "barrel" or anvil of the gun abuts the flange. Fluid under pressure is then caused to enter the cylinder, resulting in the withdrawal of the anvil. The walls of the insert buckle against the interior surface of the panel, locking the insert in place. The mandrel is unthreaded from the insert which is then ready for use.

When installing inserts of the so-called blind type, a problem can occur when the operator of the gun does not have visual contact with the insert. Most hydraulic guns are of the pump variety which requires the operator to continually pump a lever which actuates the hydraulic mechanisms, causing the mandrel to withdraw. Without visual contact the operator is unable to know except through "feel" whether the mandrel has withdrawn the appropriate distance or not. Too much pumping of the gun may damage the insert or create enough pressure within the cylinder of the gun to rupture the cylinder walls.

The assignee of the present invention has adapted a hydraulic gun of the type mentioned above so that the hydraulic mechanism can be made inoperative after the mandrel has moved a certain distance irrespective of the repeated pumping of the gun. While this is a highly advantageous feature, it has been found that different inserts require different depths and therefore varying predetermined distances of mandrel movement.

It is therefore a paramount object of the present invention to provide for an improved hydraulic gun which can be operated in a consistent manner and which minimizes insert or cylinder damage and can be used with various sizes of inserts.

It is another important object of the present invention to provide for an improved hydraulic gun that can be adjusted for different sizes of inserts.

SUMMARY OF THE INVENTION

An improved hydraulic gun for the installation of inserts comprises a mandrel capable of being threaded into an insert, a hydraulic assembly which withdraws the mandrel from an opening in a panel into which the threaded insert has been placed, and a means associated with the hydraulic assembly for adjusting the distance the mandrel moves upon withdrawal. The adjustment of this distance allows the gun to be used with a variety of different insert sizes.

DESCRIPTION OF THE FIGURES

FIG. **1** is a side-sectional view of the hydraulic gun of the present invention.

FIG. **2** is a side-sectional view (with some details omitted) of the hydraulic gun showing the position of parts after installation of an insert.

FIG. **3** is a sectional view taken along lines **1**—**1** of FIG. **2**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in FIG. **1**, the hydraulic gun of the present invention is comprised of three major sections: an anvil assembly **10**; a hydraulic housing assembly **12**; and a pump assembly **14**. Functionally, the anvil assembly **10** provides, in part, the operator with a means to properly adjust the gun in order to install the insert correctly during operation. The hydraulic housing assembly **12** along with mandrel **16** functions to lock the insert **18** into panel **20**. The pump assembly serves as a handle for the operator and additionally functions to provide the activating hydraulic pressure to the housing **12** for movement of piston **52**.

As a part of anvil assembly **10**, anvil **22** serves as a flush and stabilizing abutment against the circular flange of an insert which is flush against the surface of panel **20**. Anvil **22** is made out of a hard material and is capable of being threaded by means of a threaded cylindrical extension **24**. Extension **24** itself is threaded into bore **28** of anvil retainer **26** so that the interior facing walls of each are in an abutting relationship. Anvil **22** contains a bore which is oriented coaxially with bore **28** to receive mandrel **16**. The right-hand portion of anvil retainer **26** has diameter sufficiently reduced to be received within opening **32** of adjustable sleeve **30**. Ring **34** secured to anvil retainer **26** prevents removal thereof from sleeve **30**.

A cylindrical coupling **36** having threaded surfaces on left and right extensions engages, respectively, adjustable sleeve **30** and inner surface of bore **44** of cylinder **42**. Thus, coupling **36** serves as a mount for adjustable sleeve **30** and secures the anvil assembly **10** to cylinder and piston assembly **12**. When fully threaded into bore **44**, extension **40** of coupling **36** and ring **46** abut, respectively, against the rear wall of bore **44** and the end wall **48** of cylinder **42**. Additionally, extension **40** has opening **50** sufficiently large to receive piston **52**.

While mandrel **16** is positioned within anvil **22** and anvil retainer **26**, it is necessary to secure mandrel **16** to the end of piston **52**. This is accomplished by collar **54** which is threadedly mounted on the reduced diameter portion **56** of piston **52**. The head **58** of mandrel **16** loosely abuts piston **52** and is secured against axial movement by inner flange **60** of collar **54**.

Piston **52** is slidably received by cylinder **42**. In the fully extended position, piston head **64** is close to or

abuts the interior wall of cylinder **42**. O-ring seal **68** is located between the parallel flanges of head **64** respectively to seal the opening in cylinder **42** and the space between piston head **64** and the interior wall of of cylinder **42**.

A spring **72** engages piston head **64** and is coiled around cylindrical extension **76** of end cap **74** which is threaded into the other end of cylinder **42**. Spring **72** biases head **64** to the left, thus maintaining mandrel **16** in an extended position. An O-ring seal **66** is located between cap **74** and the inner wall of cylinder **42**. Cap **74** has a bore **78** into which a plug **80** is pressed at one end. Plug **80** contains a central opening adapted to receive pin **82** which extends a substantial length of cylinder **42** and is threaded into an opening within extension **77** of cap **74**. Piston **88** slides on pin **82** within bore **78** and serves as an abutment to spring **90**. The other end of spring **90** rides against the rear wall **92** of bore **78**. Mounted on the threaded portion of pin **82** extending beyond end cap **74** is an adjustment cap **94** which is secured to pin **82** by set screw **96**. The adjustment cap **94** may be in the form of a sleeve which slideably receives extension **77**. A friction O-ring **98** restricts movement of cap **94** over extension **77**.

Pump handle assembly **14** through valve housing **100** is mounted beneath and secured to cylinder **42** by bolts **102, 104**. A flange **106** extending downwardly from housing **100** provides a mount for pin **108** and pump handle **110**. Links **112, 114** couple handle **110** to grip **116**. Link **112** has an arm **118** with a horizontal surface which abuts and provides a support to head **122** of piston **120** positioned within cylinder **124** of valve housing **100**. Piston **120** is biased against arm **118** by spring **126** mounted around the outside of cylinder **124**. The upper end of spring **126** rides against housing **100**.

Withing housing **100** are two spring biased valves **128, 130** positioned respectively at the end of chambers **132, 134**. A port **136** provides fluid communication between chambers **132** and **134**. Chamber **132** communicates through port **138** with cylinder **42** between piston head **64** and the left wall of cylinder **42** while chamber **134** communicates through port **140** with cylinder **42** on the right side thereof. A pressure relief valve **142**, normally closed, provides direct communication between the right side of cylinder **42** and chamber **132**.

As illustrated in FIG. **3**, a spring biased ball valve **144** is positioned within piston head **64**. A valve seat **146** which threads into piston head **64** has a small centrally located opening **148** adapted to receive the end of pin **82**, allowing pin **82** to engage ball **150**, thereby allowing the volumes on either side of head **64** to be in direct communication.

To operate the handgun, an operator threads an insert **18** on the threaded end of mandrel **16** and places the insert **18** into the opening in panel **20** as seen in FIG. **1** until the flanges of the insert flush against panel **20**. The handgun is held horizontally and handle **110** is pumped, causing arm **118** to rise thus forcing piston **120** into cylinder **124**. Fluid within cylinder **124** is forced through valve **128** and into chamber **132**. The return of piston **120** to its original position, allows fluid within chamber **84** on the other side of piston head **64** to flow through valve **130** into chamber **134**. The differential in hydraulic pressure on piston head **64** causes it to move to the right as seen in FIG. **2**, thus withdrawing mandrel **16**. Because the anvil **22** maintains the flanges of the insert against the panel, the walls of insert **18** fold thereby locking insert **18** in panel **20** as illustrated in FIG. **2** also. Mandrel **16** can then be unthreaded from insert **18** by rotating anvil retainer **26** counterclockwise.

As stated before, problems can occur if the operator continued pumping the handgun so that mandrel **16** moves a distance greater than necessary for proper locking of the insert. Pumping too much results in damage to the insert and possibly to the gun itself, manifested in a rupture of the cylinder. To eliminate this problem, strike pin **82** engages ball **150** after the mandrel and piston **52** have moved a predetermined distance, i.e. the distance necessary for proper locking of an insert. Thus the pressure on both sides of piston head **64** is equalized and motion of mandrel **16** ceases.

Adjustment of the distance necessary for proper locking of an insert can be altered simply by the rotation of adjustment cap **94**. This causes strike pin **82** to rotate and move toward or from piston head **64** as desired. The gap denoted by numeral **152** between adjustment cap **94** and end cap **74** corresponds to the predetermined distance. Because of the various sizes of inserts, the predetermined distance will necessarily vary with inserts. Markings along extension **77** may be employed to indicate the appropriate predetermined distance.

At times, the depth in which a mandrel **16** penetrates an opening may vary. This is easily accomplished by loosening lock ring **38** and rotating adjustable sleeve **30**. Rotation of sleeve **30** alters the length of mandrel **16** which extends out from anvil **22**. Alternatively, anvil **22** could be replaced with anvils of different dimensions.

Still another change may be necessary if an insert of a different diameter is to be inserted and locked. This necessitates the use of a mandrel of a different diameter also. By removing the anvil assembly **10** and the cylindrical coupling **36**. Together as a unit, collar **54** can be loosened and removed. The mandrel can then be removed and a new one inserted.

It should now be readily apparent from the foregoing that various modifications and changes may be made to the hydraulic gun of the present invention without departing from the intended scope of the appended claims.

I claim:

1. A hydraulic insert fastener gun comprising

(a) A mandrel adapted to receive an insert for installation in a panel;

(b) hydraulic means for moving said mandrel from a first position to a second position, said hydraulic means including an adjustable stroke limiting means for rendering said hydraulic means inoperable after said mandrel has moved a predetermined distance from the first position;

(c) means for actuating said hydraulic means;

(d) said hydraulic means further includes a cylinder and a piston with a spring-biased ball valve means positioned with in the head of said piston and providing fluid communication between the volumes of the cylinder separated by said piston head, said valve means normally being closed; and

(e) said adjustable stroke limiting means including a stationary shaft mounted substantially axially in said cylinder and having an end which contacts and opens said ball valve after said piston has moved a predetermined distance.

2. The hydraulic gun of claim **1** in which said stroke limiting means includes means for varying the predetermined distance.

3. The hydraulic gun of claim **2** in which said means for varying the distance includes an adjuster cap fixedly

secured to said shaft for moving said shaft in the axial direction.

4. The hydraulic gun of claim 3 in which said shaft is threadedly mounted in a rear wall extension of said gun and said adjuster knob is secured to a portion of said shaft extending through said rear wall extension.

5. The hydraulic gun of claim 3 in which said rear wall extension is slidably received by said adjustor cap.

6. The hydraulic gun of claim 5 in which the outer surface of said rear wall extension bears indicia indicating a selected predetermined distance when aligned with said adjuster cap.

7. A hydraulic gun for the installation of fastener inserts into a panel comprising

(a) a cylinder and piston with a biased closed valve means located in the piston head;

(b) a mandrel fixedly mounted adjacent to and abutting the other end of said piston;

(c) a shaft externally adjustably mounted for axial movement and having one end within the cylinder which is adapted to contact and open said valve means after said piston has traveled a predetermined distance; and

(d) shaft adjusting means mounted on the other end of said shaft for adjusting the position of said shaft along its axis, thereby changing the predetermined distance.

8. The hydraulic gun of claim 7 in which said cylinder has a rear wall with a threaded bore adapted to receive a complimentary threaded length of said shaft, said shaft extending through said threaded bore and supporting an adjustor knob fixed against relative movement with respect to said shaft whereby rotation of said adjustor knob causes said shaft to move axially with respect to said valve means.

9. The hydraulic gun of claim 8 in which the distance between said adjustor knob and the rear wall of said cylinder is equal to the predetermined distance.

10. The hydraulic gun of claim 8 in which an extension of said rear wall defines said threaded bore, said adjustor knob being a sleeve which slideably receives said extension, said extension bearing indicia for indicating the predetermined distance which aligned with said knob.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,462,240

DATED : July 31, 1984

INVENTOR(S) : Albert K. Yamamoto

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page should be deleted to appear as per attached title page.

Signed and Sealed this

Twenty-second Day of *January 1985*

[SEAL]

Attest:

DONALD J. QUIGG

Attesting Officer *Acting Commissioner of Patents and Trademarks*

United States Patent [19]

Yamamoto

[11] **Patent Number: 4,462,240**

[45] **Date of Patent: Jul. 31, 1984**

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[73] Assignee: **Rexnord Inc.**, Brookfield, Wis.

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Primary Examiner—Francis S. Husar

Assistant Examiner—Linda McLaughlin

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